Orientational Transitions in a Nematic Confined by Competing Walls

I. Rodriguez Ponce,[1] J.M. Romero Enrique,[1] E. Velasco,[2] L. Mederos,[3] and L.F. Rull[1]

[1]*Departamento de Eisica Atomica, Molecular y Nuclear*
Area de Eisica Teorica, Univeraidad de Seuilla
Aptdo 1065
Sevilla, 41080, Spain

[2]*Departamento de Fisica Teorica de la Materia Condensada*
Universidad Autonoma de Madri
E-28049 Madrid, Spain

[3]*Instituto de Ciencia de Matericles*
Consejo Superior de Investigaciones Cientificas
Cantoblanco E-29049 Madrid, Spain

The phenomenology of a confined nematic phase is presented. We have employed density functional theory to study a nematic phase confined by two walls which favored opposite orientations. The director of system defined as the average orientation forms an angle with the axis perpendicular to the solid interface called *tilt angle*. We focus our attention on variations of this quantity with the spatial coordinates along the pore. We have chosen wall parameters of which one favors homeotropic and the other planar orientations. On the other hand, the nematic phase in its interface with the isotropic phase is planar oriented. The competition of the fluid-fluid and fluid-nematic interactions will play an important role to define the stable configuration. In this sense, a transition from a constant to linear dependence of tilt angle on the spatial coordinate within the pore is provided. The dependence of this orientational transition on the pore width and surface fields is also studied. This study reveals that for narrow pores the nematic in the pore presents a homogeneous tilt, for which the value is the same that corresponds to the nematic-isotropic interface. For larger pore widths the tilt suffers a deviation to the linear form that is predicted in Landau-like theories. A study of the surface tension shows that this transiton is continous with respect to changes of the wall parameters. We also provide information about the nematic-isotropic transition within the pore and we compare with the bulk case.